

CRADA facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

GAS STREAM cleanup
PROJECT

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ON-LINE PARTICULATE MONITORING AT THE FETC MODULAR GAS CLEANUP RIG (MGCR)

Capabilities

Two optical particle monitors have been modified for on-line process-stream particle monitoring: the Particle Measurement System (PMS) Classical Scattering Aerosol Spectrometer Probe (CSASP), and Insittec's Particle Concentration, Size, and Velocity Probe ((PCSV-P). Both units use a laser light-scattering technique to measure particle size. They provide process particle count and size distribution data.

PMS initially developed particle monitors for atmospheric aerosol monitoring. Under a DOE contract, PMS developed two units to sample particulates in high-temperature, high-pressure (HTHP) process streams. The model CSASP 100HTHP units are designed to operate at temperatures up to 538 °C (1,000 °F) and pressures up to 2.07 MPa (300 psia).

Insittec designed their PCSV-P particle monitor for in-situ measurements in near-atmospheric smoke stacks. We adapt the unit for on-line HTHP process-stream applications by using optical inserts. The insert design then specifies limiting operating conditions. Our most recent insert, assembled with common tubing and tubing adaptor components, sampled extracted process gas at 316 °C (600 °F) and 207 Pa (30 psig). We plan to design a simple, inexpensive, yet rugged insert that is capable of operating closer to typical process-gas conditions (538 °C or 1,000 °F, and 2.07 MPa or 300 psia).

Both units have been tested on FETC's MGCR in work to support Shell CRADA filter tests, and to obtain particulate data for dust-cake modeling efforts in support of FETC's integrated gasification combined-cycle (IGCC) hot gas cleanup program.

We have adopted a modular approach to packaging the optical particle monitors. Each monitor is configured in a modular instrument rack and includes provisions for window purge gas, sample gas-flow measurement, and filter grab sampling. This modular approach reduces the amount of on-site preparation. The particle monitoring equipment is portable (no heavy equipment handling is required), and can be set up at remote locations. On-site preparation typically includes sampling-probe and isolation-valve installation, access to site nitrogen for window purge, and venting of the sample gas. Sample conditioning can be integrated with the instrument rack hardware to provide extracted sample gas at a temperature, pressure, and sample gas flow rate that is compatible with particle monitor specifications.

